DOCUMENT RESUME

ED 431 948 CE 078 980

TITLE	Knowledge Management.
PUB DATE	1999-03-00
NOTE	35p.; In: Academy of Human Resource Development (AHRD) Conference Proceedings; see CE 078 963.
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Adult Education; *Business Administration; Corporate Education; Educational Needs; Educational Practices; Human Resources; *Knowledge Level; *Labor Force Development; *Management Development; On the Job Training; Organizational Development; Outcomes of Education; Staff Development; Teaching Methods; Training Methods
IDENTIFIERS	*Knowledge Management

ABSTRACT

The first of the four papers in this symposium, "Knowledge Management and Knowledge Dissemination" (Wim J. Nijhof), presents two case studies exploring the strategies companies use in sharing and disseminating knowledge and expertise among employees. "A Theory of Knowledge Management" (Richard J. Torraco), develops a conceptual framework for information systems using Dubin's methodology for theory building. Drawing on existing theory and recent empirical studies, a theory of knowledge management is developed. Questions investigated in the third paper, "Signposts on the Road to Knowledge Management" (Allison Rossett, James Marshall), include the following: What is knowledge management and why is it important to human resource professionals? What is the status of knowledge management in organizations and human resource and training units? and Are consulting firms leading the way? "The Relationship between Human Resource Development and Business Strategy in 1998 Fortune 500 Companies" (Erica D. Kalata, Tim L. Wentling) reports on a study that found significant relationships between business strategy and human resource development in 52 Fortune 500 companies. (KC)

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ED 431 948

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16-2 A Theory of Knowledge Management

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16-3 Signposts on the Road to Knowledge Management

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16-4 The Relationship between Human Resource Development and Business Strategy in 1998 Fortune 500 Companies

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Knowledge Management and Knowledge Dissemination

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The importance of knowledge in companies has increased in the last ten years. Knowledge seems to have become more important than labour, capital and raw materials. It is true that in many western countries, but also in Asia, societies are growing into service oriented labour markets. Many authors perceive a huge growth in service sectors. Many experts see a world in which people exist by the exchange of information and knowledge, in which knowledge is not only a tool to work with, but also a sellable product. This fact as such is not new; what is new is the fact that for so many people it will become a new job : the knowledge worker. In two case studies an exploration takes place of strategies companies use in sharing and disseminating knowledge and expertise between employees.

Keywords Knowledge Management, Learning Organization, Technology

Introduction

The demand of knowledge intensive services is growing so rapidly that companies are producing more and more services instead of goods. Manual and craft sectors are going to change into intellectual work: from handwork to brain work and the life cycle of products is going to be shorter. Designing and developing intelligent products and processes are becoming more important, also because of cost- benefit ratios. Organisations must act and be pro-active as fast as possible to changing demands and technological growth (Sogtoen, 1996). Knowledge management, therefore, is a consequence of a changing paradigm - from an industrialised toward an information based economy.
Some writers, like Drucker (1993), see a three stage model in which the importance and relevance of knowledge is increasing:

- the industrial revolution in which application of knowledge leads to new products and tools; concentrating of this type of work became visible in big factories;
- production revolution in which knowledge is connected to work; scientific management(Taylor) is the scientific expression of this leading to more efficiency and productivity;
- The third phase - we are in the middle of this - is marked by the connection of knowledge to knowledge. This phase is characterised by the focused use of knowledge and expertise, systematic and targeted to solve problems.

Human resource development in companies is dependent of this kind of developments. What will be the needs for trainees and employees in terms of knowledge and expertise? What are the new job requirements in terms of handling these new skills? How should a company profit from this? Before analysing two cases from business and industry introducing strategies for knowledge management some important concepts have to be defined: data, information, knowledge and expertise, because these concepts play an essential role.

Data, Information, Knowledge & Expertise

It is not easy to define the four concepts. For the sake of a clear understanding we will not now go into a semantic analysis or a hermeneutic analysis of all possible meanings. We simply define three levels :

- data: simple registrations and observations, without special meaning (i.e. a telephone book);
- information is giving meaning to data
- knowledge: information that has been taken up in a frame of understanding and will be handled by the user.

The concepts of expertise and competence are used in this text as interchangeable with knowledge, while the cognition and skills needed to carry out a certain task within a company can be interpreted as the knowledge structure. Procedural and declarative knowledge is needed to solve problems and are based also on factual and

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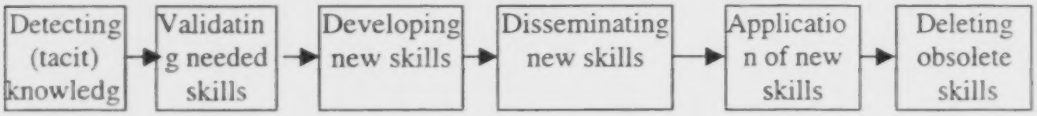
conceptual knowledge. Competence in this context means the ability to use knowledge, especially when related to the use of systems (i.e. computer programs, manuals, information systems). Competence is connecting people and systems: together both people and systems are competence (Sprenger, 1995). Added value, as a consequence of connecting people to systems, is the output of competence and conditioned by the worker. Electronic Performance Support Systems (EPSS) is one of the possible operationalisations of competence (Bastiaens, 1997). What then is knowledge management?

Knowledge or Expertise Management

Basically, knowledge management is the process of making explicit the tacit knowledge of employees to optimise the effectiveness of the knowledge chain in a company. Knowledge management is also not focused on one person; the target is the organisation, optimising the performance of the organisation at three levels: individual, process, and organisation (Rummler & Brache, 1995).

In all of these we find opportunities for interface management, which can be defined as knowledge management - detecting existing knowledge, validating the necessary knowledge and skills, developing new knowledge, disseminating, applying and deleting (old and obsolete) knowledge.

Figure 1: The knowledge chain (Weggeman & Boekhof, 1995)



Knowledge management, according to Weggeman & Boekhof (1995), creates a more intelligent organisation, competent and very conscious of expertise and critical issues. Knowledge management (KM) is essential for all parts of the company: for Human Resource Development and Management, the organisation of knowledge, the application of knowledge, barriers to and opportunities for using knowledge (Wiig, 1993). Human Resource Development (HRD) and Human Resource Management (HRM) are usually departments using a set of interventions to unleash human competence or to guide the organisation to better performance. Different sets of instruments can be used for this: knowledge technology and knowledge creation (Van der Toorn, 1996).

Knowledge Technology

This type of technology is focused on the use and availability of knowledge and is related to taxonomies and the detection of available knowledge and their dissemination and use. To see whether knowledge can be used, it is important to know where and how knowledge has been stored. In analysing stored knowledge it is possible to find out where the knowledge is and who is working with it. Different types of storage of information and knowledge can be distinguished:

- knowledge in people (human knowledge): difficult to externalise and bound to human beings;
- mechanised knowledge in machines and apparatus (hardware), useable but restricted knowledge;
- knowledge in documents: books, manuals, and guidelines, job aids, etc. This type of knowledge can be found easily, but is not used on a daily basis;
- automated knowledge in electronic (support) systems; normally containing information and knowledge for diagnosis, design, therapy and planning. These systems normally function as decision oriented systems or management systems. (Boersma, 1993; Sprenger, 1995; Van der Zee, 1992).

Managing the interaction of the four types is a kind of knowledge management in an organisation. If a manager is willing to change one of the parts, it will have an effect on the other ones.
The storage of knowledge in those different parts of the system seems to be dependent of the type of knowledge. Many organisations have the feeling that knowledge really is a part of the organisation, when it has been documented.

Nonaka (1991) and Nonaka & Takeuchi (1995) introduced the concepts of "explicit and tacit knowledge". Explicit knowledge is formal, systematic knowledge, which can be communicated through languages and can be documented in procedures, product specifications and scientific and technological principles.

Implicit knowledge, however, is knowledge based on experiences. It is subjective, not always and easy to explain in formal language, rooted in actions and commitment of people in a certain context. This type of knowledge has two components: a technical and a cognitive component. The technical one is called "know -how" or "Spitzengefühl" (an intuitive kind of knowledge); the cognitive component consist of mental models, beliefs and perspectives. It is an attitude and an implicit way of looking at reality. How can we grasp the implicit knowledge or make the hidden knowledge visible? Different techniques exist like case base reasoning, task analysis, critical incident technique, and adoption and knowledge acquisition techniques. All of them are time consuming and none of them will ever lead to a fully understandable and complete documentation of all the hidden knowledge. Therefore scientists are looking for modes of dissemination within an organisation, using strategies to disseminate knowledge. Sadler & Miller (1993) name four strategies:

1. Dissemination of knowledge through co-operation in teams and projects;
2. Extracting knowledge from people, documenting and storing the knowledge in archives and files;
3. Institutionalising knowledge by using a machine bureaucracy;
4. Creating material and social exit barriers (working climate, rewarding systems).

Implicit knowledge might be understood better through informal communication. Classical forms of on- the -job learning use the modelling principle through which a tutee observes the tutor in solving problems, picks up the key problem solving skills, the sequence, the tools, and the contextual sense and feeling of craftsmanship and expertise. The (body) language and the level of communication are thus very important. Meaningful communication between expert and novice, between expert systems and users, between tutor and tutee, between master and apprentice, are based on mutual understanding both verbal and non verbal.

Knowledge Creation or Knowledge Generation

Part of the knowledge diffusion problem is connected to knowledge use. Using knowledge in a context often means moulding the knowledge and generating new insights on the basis of new experiences, through interdisciplinary co-operation, problem solving capacity, entrepreneurial behaviour and co-operation.
Diffusion of knowledge is often more diverse and linear, whilst knowledge generation is circular and complex. This process can take place between people, machines, systems, and documents.
According to Sprenger (1995) knowledge generation can take place in different patterns:

- Application: using standards problems and routines
- Adaptation; optimising existing procedures for problem solving
- Exploring and discovery; developing new techniques and problem solving procedures, (sometimes leading to new patents).

Besides the use of knowledge, the creation of knowledge is related to added value and growth. Knowledge creation is connected to getting new knowledge and development through reconstruction of existing perspectives and assumptions (Nonaka, 1991). Nonaka gives the example of designing a new car (the Honda Civic) as a solution for people in big cities. It is a small car, very flexible, very mobile, with the largest volume (as a consequence of the "egg form"), but very comfortable.

At that time, it was a revolutionary concept, which was later imitated by many carmakers. This process was related to designing a new product, but Nonaka uses the example to show that four basic processes took place:

Socialisation: through which tacit knowledge is transferred into tacit knowledge (norms, values, attitudes) by using observations, language, imitation or exercises.

Externalisation: through which tacit knowledge is transformed into explicit knowledge in using images or metaphors

Internalisation: by which explicit knowledge is transformed into tacit knowledge. This is the more traditional type of learning processes (see the work of Piaget);

Combination: the exchange of explicit knowledge; exchanging existing knowledge.

Figure 2: Knowledge creation strategies according to Nonaka (1991)

from\ to	**Tacit knowledge**	**Explicit knowledge**
Tacit knowledge	Socialisation	Externalisation
Explicit knowledge	Internalisation	Combination

However insightful this matrix may be, there is a long way to go to build an HRD and HRM system in which these four strategies, in combination with the storage of information, can be used effectively to create a high performance organisation. The role of knowledge management is mostly connected to the explicit kinds of information and knowledge exchange. In the case of experts, some companies have tried to track down the expertise and capture it for the benefits of the companies, especially in companies where employability of older workers is a real problem. Some experiments took place in the Netherlands to keep and save the tacit experiences, skills and process knowledge in, for instance, the service sector (for example the very efficient problem solving skills and colour mixing skills in the textile industry.

Another motive is related to cost saving. On the job training is often based on cost saving arguments (Van der Klink, 1997; Jacobs, 1995). Using on- the- job training as a training strategy, employees have to learn by observation, by learning by doing, on an individual basis. Keeping people away from off- the- job training does save a lot of out- of- pocket costs. But does it deliver better internalised knowledge and competence? And, does it lead to return on investments and to transfer of knowledge? (Phillips, 1995; Gielen, 1995).

Task complexity can be the prime motive in seeing whether the Nonaka strategies can be used effectively. For easy and routine kinds of tasks it is difficult to recommend complicated strategies. Informal learning and acquiring implicit knowledge is quite easy and it is relatively simple to observe how people act (Bastiaens, 1997). Complex tasks, however, demand integrated use of knowledge. In these cases, hidden or implicit knowledge, can play a big role in reaching a degree of competence.

Organising and designing a working environment as a learning environment can stimulate the creation of new knowledge in which implicit or hidden knowledge can grow. The ideas of the learning organisation (Senge, 1990; Watkins & Marsick, 1991) and also experiments with the 'Leittextmethod' in Germany and the Petraproject with Siemens, make clear that new pathways of learning and working, that new border crossings (Engeström, 1994) will take place, in which people will construct new knowledge and performance through co-operation, communication and assessment (Barnes & Todd, 1977).

Not every employee might be capable of understanding implicit knowledge as not every student is capable of understanding in a very explicit way the formal knowledge transmission. The way knowledge has been codified, the way knowledge is accessible, the characteristics of the employee as a learner, inventor, communicator and user of knowledge, are very important factors in understanding the processes of organising knowledge management in organisations.

In the next section, two cases will be described in which companies have designed procedures and instruments for knowledge management. It will be clear from the information that follows that these cases are starting in a zero phase.

The research questions that we are interested in are:

a) What is the motive of the company to go into knowledge management
b) What type of knowledge management does take place?
c) What are the effects of introducing knowledge management?

Case 1: Designing a Tool for Knowledge Management (Dutch Telecom)

Dutch Telecom decided to set up a study in 1992 to develop a tool for expertise management. The concept of expertise is based on a combination of knowledge, attitude and skills. Having expertise available at the right moment, at the right place, is a precondition for Telecom to carry out services. This is a requirement for existing, as well as for new tasks and services. Using expertise is one of the ways to optimise performance of the organisation (Hoekstra, 1995, p. 4). To find the expertise and to manage the expertise can be an asset to the organisation.

Benchmarking procedures can help to find out whether expertise management will lead to a better performance, when compared with competitors. Managing expertise will therefore be focused on:

- defining expertise per task and per division
- describing the importance of a task and service
- what expertise can be found and where
- who are the best carriers for expertise
- what is the gap between necessary needed and existing expertise
- what are the best solutions for this problem?

The main task for Dutch Telecom is to design a tool for detecting expertise. For such an instrument, requirements or specifications should be formulated: functional specifications, operational specifications, frame factors and requirements, and design restrictions. Well, it is clear that

- the tool must fit with the goal of expertise management.
- the tool must be generic in the sense that all divisions within Dutch Telecom can use it.
- there must be a tool that can be customised to the setting.
- the tool should be transferable to HRD officers within Telecom
- the tool should be user friendly and transparent, consistent, not complex.
- the interdependence of stages in finding expertise should be restricted
- the tool must fit with the management style of Dutch Telecom
- the tool has to be ready within 6 months

To set up a tool a case was chosen within Telecom - a satellite station in the Northern part of the Netherlands. This station is the largest satellite station in Europe and connects all the communications all over the world (telephone, tv-signals, ship communication, airline communication). It is a relatively small size case because of the limited number of 40 people working there: mainly technicians for the operation and the maintenance of the satellite station. It has to function 24 hours a day, 7 days per week. There are five business units, covering different parts of the market e.g.consumermarket, business, network. international telecom, and telematic systems. The satellite station is part of International Telecom.

Within the station different groups are working on different tasks. It was decided by the manager to study a special group of people who were responsible for the maintenance of the transmission group. This group is a merger from two older ones: a service and maintenance analogue group, and a digital group. Both groups have experiences with different systems but the new tasks will be the responsibility of the whole group (analogue and digital). Administrative tasks are also part of the responsibility. Monitoring the satellite and transmission services is the main task to carry out.

Within the study of expertise detection the problem has to be defined. In the satellite station 4 monitoring groups are available. The monitoring service is organised in such a way that a person has to be available 1 week out of four. In the near future every employee should take part in all the systems available. The manager is planning a system in which everybody can carry out a service once in eight weeks. The conclusion is that every employee is capable of handling all the systems. It is now necessary to know which expertise is available and how the new expertise can be learned.

In the old situation all the expertise of all the systems is stored in one or two employees. This is a very vulnerable situation and reason to change over to a fully equipped staff with expertise. How can the staff move from a 1:4 toward a 1:8 monitoring service?

What are the problems in detecting expertise?

- What is the level of expertise needed for the monitor function? Is the employee capable of solving all problems, in which case high expertise is required. The alternative would be that the safeguard person only needs to understand now to keep the system active, for instance in using bypasses.
- There is no insight in the diagnostics, no records of breakdowns and there is no systematic log file. Information is handed over informally sometimes.

There is no clear concept of and understanding of what is exactly needed.

After a presentation of the preliminary findings the manager has taken the decision not to take up all the systems for monitoring in the study, but just one. This was problem solving by piece meal engineering: take just one function of the system: Intermediate Data Rate (IDR)(an analogue system).

To have a full insight in the type of work of maintenance and service of IDR, all workers have been interviewed. Nobody was fully informed, nobody had an overview. In gathering all the pieces together and trying to talk to former managers of the division, a picture of five functions became visible:

a) constructing connections
b) testing connections
c) maintenance
d) alarms
e) documentation

All these functions have to be done according to technical rules and specifications. One of the assumptions of the researcher was that all the information could be collected and documented to make it available for all, but very soon, this picture was broken down:

- Sometime it is not only the yet incapability of workers to formulate precisely, but also mistrust. Losing expertise means losing power. This might lead to re-engineering of tasks and clusters of tasks.
- The effect is uncertainty and unwillingness to change;
- Using flow charts proved to be an effective means in mapping the task, functions and chains of decision making.
- On the basis of these cognitive maps the knowledge, skills and attitudes could be detected.

For this type of case it is important to know what the real reasons are and what the best tools and techniques are to detect the adequate skills (cognitions, attitudes and psycho motor skills).

These skills will be used for figuring out the gap between demanded and offered skills in using a questionnaire for self-assessment of needs. But even this instrument proved to be a threat to the employees. Just 50% of the respondents of this department (n= 16) responded. Interviewing might have been a better instrument to use. However, there was some response on different functions:

- Maintenance seems to be not applicable
- Constructing connections is important to four persons
- Testing connections is an average need for the total group
- Alarms and documentation are functions not being covered and mastered by the group

While all the employees have to work with all the functions, just 50% of the group is capable doing so in just two functions. So how is the learning gap to be bridged? Teamwork, transmission by colleges, reflection in teams after work, is the means proposed by the management. From interviews, however, it is known that the members of the IDR team do not co-operate. The expertise is exists, but will not be transferred. Not even reflection takes place. Evaluation of his or her job is up to each member of the team.

Working in steps toward a model of gathering insight in expertise was the main target of this case study. But at the same time it was discovered incrementally, that it is not easy to download the experiences and expertise from people for the benefit of all.

In the end the real question proved to be: "Who is going to serve as the maintenance agent at the weekend?" So, serving the targets of the company to have fully trained and highly expertise people to run a satellite station did not fit with the family intentions to spend the weekend outside the satellite station.

Knowledge management is not just a matter of finding expertise and allocating people on the basis of this. Work is also a culture, and free time is part of human life. Not analysing this potential conflict, lead to a naive procedure for detecting skills. So, it is communication between people, managers and employees that count.

Case 2: Designing a Knowledge Bank for Knowledge Dissemination

The ING bank in which this study took place, is a merger of three former institutions: the Postbank, the NMBank (specialised in Small and Medium Enterprise Financing) and National Nederlanden (NN), an international insurance company. The cultures and tasks of these three institutions are quite different. The mergers are meant to grow and to maximise new opportunities as a consequence of co-operation.

All the institutions did have an HRD department, but these were brought together in one department for the whole company. HRD is part of HRM. Every branch, however, can preserve their own educational division for standard training. The HRD department has to build up a new image of customised training and advice, in stead of being the provider of standard courses.

In order to be a customer driven organisation, as well as a good interface between the different training departments, the HRD manager takes the decision to design and test a tool for saving expertise and to raise the accessibility of information for all by designing a knowledge bank. In using the System Approach Model of Kaufman (1979) there is some feeling that a workable knowledge bank might be the output. The Kaufman model consists of five steps:

- identify the problem
- determine solutions and alternatives
- select the best strategy
- implement the solution
- evaluate the effect

Based on information models, prototyping principles and reasoning processes not so much the needs of the employees were taken as the guiding principles, but essential organisational activities, functions and objects (Visscher, 1994; Sogtoen, 1996). In the process of prototyping an information bank, however, the user can be interactive and evaluative and have impact in the evolution of the knowledge bank. How meaningful this point of view might be the communication strategies and policies of HRM and HRD did not allow passing by the needs of the clients. Employees therefor had to be interviewed about their activities and computer needs. On the basis of this information a design of a knowledge bank should be made even when the analysis of existing systems of knowledge exchange in different organisations can help to a better understanding of the use and functionality of these concepts. The consequence of this is that a survey should be organised for all HRD professionals (n=59) to let them express their needs in relation to a knowledge bank

Results[1]

The questionnaire was set up to find information about the needs of HRD professionals in knowledge management by using a knowledge bank. Based on this questionnaire 39 responses were collected (66%) of the HRD professionals. On the basis of the response it was found that carrying out training is the most frequent and most important activity, as well as organising meetings, developing course materials, interface management, counselling, and policy studies. Undertaking evaluation research and self study (reading of professional literature) and coaching and guiding of trainees do not score highly.

Respondents agree that the proposed knowledge bank could help to *organise the information* chain in the organisation. Having an overview of all the available course material in all departments of the company could help to prevent reinventing the wheel. Such a knowledge bank could also help *to generate new ideas about course design*, tools, tips, and tricks, as well as good teaching examples.

For counselling and giving advice to employees for example about *job rotation, career planning*, the knowledge bank can also play an important role. Keeping people up to date on the training market was not identified as a special need.

In general, HRD professionals asked for a knowledge bank for direct problem solving for training professionals; that is offering and developing training.

Tabulating four functions could indicate the functionality of the bank; printing, searching people, mailbox, and communication tools. Printing seems to be most important. Also having a mailbox, which can be used for remarks, questions tips. Other functions like communication and searches were not perceived as essential, for the time being.

The conclusion is that the knowledge bank as a prototype needs to address questions and problems related to advice, information, and developing course materials.

All kinds of technical questions can be raised about the functionality and accessibility of the proposed bank. Important are the reliability of data and the validity of information. For the understanding of this case here it is enough to know that these conditions have to be tested. (See Sogtoen, 1996) in using a reference strategy.

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[1] For an exhaustive description of the methodology of the study see K. Sogtoen (1995). Op weg naar kennismanagement. Enschede: Universiteit Twente (doctoraal studie toegepaste onderwijskunde).

The Reference Strategy

This strategy is used to find other systems with the same targets in the Netherlands. Different systems do exist, externally and internally in companies. Four systems are compared and tested, especially to see whether the searching strategies are efficient and practical. (Sogtoen, 1996, p. 74-75). One of the systems has been chosen as a tool, based on its functionality for searching, the type of interfaces and connections, browsing information, printing options, password protection, operating system, costs, and experience with the system.

The last step was to codify all the educational and training material of the three institutions for incorporating into the knowledge system.

Effects?

Does a knowledge bank work and does it help to disseminate and exchange information? After a pilot test to see whether the bank can be used for a field-test, the following results came out: The user did not have time to test the system on the job, for which it was designed! From a re:ponse group of 106 only 15 HRD professionals reflected. Even this group felt down to about 8 people telling almost nothing. In a discussion after the test the following perceptions and conclusions emerged:

- looking for information is a time consuming process, often connected to serendipity
- there is a strong need for an overview of all the course materials within the company; not every professional is willing to put his/her course materials in the bank;
- there is a need to have an overview of experts in the company, to contact them, call them and have their advice;
- there is a need for the course offerings of a select set of external training providers; these are not in the system yet;
- protecting the copyrights of designers is important;
- the need for one standard is not apparent; every division has its own needs that have to be covered.

Knowledge Management and Dissemination: Some Conclusions

Knowledge and expertise are important tools in organisations today. Not only people carry knowledge. Knowledge can be stored in different forms and formats. But people want to be informed, will transform information into knowledge and will communicate this knowledge for the sake of themselves, the processes they serve, and the company. But identity and copyrights must be protected, information must be valid, and norms an values of people and organisations must also be protected.

Organisational climates and cultures could hinder the exchange of information and the quality of communication. Both cases show that searching for solutions and designing tools is not an easy path. It is a kind of learning to understand processes, people and their motives, and to break down barriers in communication structures. If we take the four processes of Nonaka as key strategies toward an information and learning society, then we might tentatively conclude on the basis of these two case studies, that we are on the tip of the iceberg of tacit knowledge. We need a better understanding of social and power structures. It is not so much the design of high tech systems, but the realisation and implementation of high touch systems in which people trust to share and disseminate expertise. We need informal places like coffee corners and social places to communicate and to learn to open social structures. Internalisation and institutionalisation of explicit knowledge will go on, just to keep us going in a world of routine and standards.

It may be that Electronic Performance Support Systems (EPSS) and the informal way of using virtual learning environments, can help us, to overcome prejudice, power and pride, because of a lost weekend or a misguided feeling of secret genius training solutions.

References

Barnes, J. & D. Todd (1977) Communication in small groups. London: Heinemann

Bastiaens,, Th. J.(1997). Werken en Leren met Electronic Performance Support Systems:Een effectevaluatie. Enschede: Universiteit Twente.

Boersma, S.K. Th. (1993). Kennissystemen en kennismanagement. Bedrijfskunde, jrg. 65, nr. 4, 350-412.

Drucker, P.F. (1993). Van kapitaal naar kennis: de organisatie- samenleving. Management-selectuur, 3, 1-10.

Hoekstra, T. (1995). De ontwikkeling van een methode voor het managen van expertise bij Koninklijke PTT Nederland NV. Enschede: Universiteit Twente (afstudeeropdracht).

Jacobs, R.L. & McGriffin, T.D. (1987). A Human Performance Supportr System Using a Structured On the Job Training Approach, Performance & Instruction, 26 (6), 8-11.

Kaufman, R., & English, F.W. (1979). Needs Assessment: Concept and Application. Englewood Cliffs: Educational Technology Publications, Inc..

Nonaka, I. & Takeuchi, (1995). The Knowledge Creating Company. Harvard University Press.

Nonaka, I., (1991). The knowledge creating Company. Harvard Business Review. Nov.-Dec, 96-104.

Rummler ,G. A. & Brache, A.P. (1995). Performance Improvement: How to manage the White Space on the Organisation Chart. San Francisco: Jossey Bass, Inc. Publishers.

Senge,P. (1990). The Fifth Disciple. New York: Doubleday

Sogtoen, K.A.W.M. (1996). Op weg naar Kennismanagement. Enschede: Universiteit Twente (afstudeeropdracht).

Sogtoen, K.A.W.M. (1996). De rol van Integrated performance support systems. Enschede: Universiteit Twente).

Sprenger, C., Van Eijsden, C., Have, S. ten, & Ossel, F. (1995). Vier Competenties van de lerende organisatie. Gravenhage: Delwel Uitgeverij.

Van der Klink, M., (1997). Leren en opleiden on the job. In : Nijhof, W.J. (ed). Ontwikkelingen in het Beroepsonderwijs en de volwasseneducatie. Alphen aan den Rijn: Samsom Tjeenk Willink (forthcoming)

Van der Toorn, T. (1996). Kennis: van reactie naar creatie. Organisationele kenniscreatie. Handboek Effectief Opleiden, 6, 1.01-1.21. Den Haag: Delwel Uitgeverij.

Van der Zee, H.J.M. (1992). Het vernuft van organisaties. Opleiding en Ontwikkeling, 3, 3-6.

Watkins, K., & Marsick, V. (1991) Sculpting the Learning Organisation.

Weggeman, M., & Boekhoff, T. (1995). Kenniswerkers en Kennismanagement. Holland Management Review, 42, p. 80-89.

Wiig, K.M. (1993). Practical knowledge management: experiences in USA. Presentation to the international conference Kennistechnologie 93: 28 oktober 1993, RAI, Amsterdam.

A Theory of Knowledge Management

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Knowledge is now recognized as an organization's most valuable asset. Leading organizations have developed systems to leverage the value of knowledge to meet their objectives. Because knowledge is a complex and intangible asset that cannot be managed like other resources, organizations that do not systematically examine the cultural and technical dimensions of knowledge management experience difficulties with this task. These organizations develop information systems that are not grounded in a sound conceptual framework, in part, because they have no framework for knowledge management. This paper develops such a framework using Dubin's methodology for theory building. Drawing on existing theory and recent empirical studies of this issue, a theory of knowledge management is developed. Implications for further study of this issue are proposed.

Keywords: Knowledge Management, Theory Building, Intellectual Capital

A theory that purports to advance the understanding of how knowledge is managed in organizations must draw from a broad theoretical base because the phenomenon the theory attempts to explain, knowledge management, is itself a pervasive concept that effects every aspect of how an organization functions. Knowledge management deals with knowledge as a vital, yet intangible asset that warrants at least the level of attention given to other valuable resources. Organizations cannot afford to take a passive stance toward knowledge management in the hopes that people are acquiring and using knowledge, and that sources of knowledge are known and accessed throughout the organization. Instead, the theoretical and empirical work cited here support a bold, proactive strategy for developing and managing knowledge. Organizations seeking to sustain competitive advantage have moved quickly to develop systems to leverage the value of knowledge for this purpose (Robinson and Stern, 1997; Stewart, 1997).

Four theoretical traditions provide the basis of this paper—human capital theory, the nature of expertise, organizational learning, and knowledge management. Each of these areas brings an important element to the task of advancing our understanding of knowledge management. These four theoretical foundations are reviewed next.

Human capital theory. Human capital theory is a branch of economics. Economics addresses the allocation of scarce resources among a variety of human wants. Economics represents human wants and the scarcity of resources as essential and perennial elements in the study of any human activity. As with the social sciences in general, economics is not an exact science and predictions of economic developments are subject to error. According to Lewis (1977), however, economics is the social science "with the most sophisticated body of theory—that is, the one with the greatest predictability accuracy of all the social sciences" (p. 43).

Human capital theory is considered the branch of economics most applicable to education and human resource development. While Theodore Schultz' (1961) address to the American Economic Association was the first presentation of research on the return-on-investment in human capital, Gary S. Becker is generally credited as the leading developer of human capital theory. Classical economic theory considers labor as a commodity that can be bought and sold. Because of the negative connotations associated with the exploitation of labor by capital, it is understandable that human capital theory is still suspect in some circles. However, unlike the meaning traditionally associated with the term "labor," human capital refers to the knowledge, expertise and skill one accumulates through education and training. Emphasizing the social and economic importance of human capital theory, Becker (1993) quotes the economist Alfred Marshall's dictum that, "the most valuable of all capital is that invested in human beings" (p. 27). Becker considers education and training to be the most important investments in human capital.

The nature of expertise. Despite over thirty years of research, the question, "what is expertise?" has not been satisfactorily answered. Seminal works have identified seven key characteristics of expert performance (Chi, Glaser & Farr, 1988), methodological approaches to the study of expertise (Ericcson & Smith, 1991), the process through which expertise is developed (Anderson, 1982), the characteristics that distinguish the expert from the experienced non-expert (Bereiter & Scardamalia, 1993), and taxonomies of performance domains (Holton, 1999). Although the fields of education, information systems, and knowledge engineering have contributed to the present understanding of expertise, the majority of research on this topic has been done in cognitive psychology and the cognitive sciences (Kuchinke, 1997).

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While much remains to be learned about the nature of expertise, Herling (1997) proposed an operational definition of expertise synthesized from this research. His definition is based on three foundational concepts: (1) expertise is a dynamic state, (2) expertise is domain-specific, and (3) expertise is composed of knowledge, experience and problem-solving. Herling defined expertise as "the ability of the individual to consistently do the right things in the right way." Although inconclusive, current thinking on the nature of expertise provides a basis for classifying and representing different types of knowledge.

Organizational learning. Research on organizational learning has emphasized the importance of adopting a holistic, systemic approach to creating a work environment that cultivates the learner, learning processes, and a learning infrastructure. Catalyzed by the immensely popular work of Senge (1990), recent research has identified strategies for the transformation to a learning organization (Watkins & Marsick, 1993), models of organizational learning (Schwandt, 1995), models and instruments to assess team learning (Dechant, Marsick & Kasl, 1993), learning organization implementation reports (Bierema, 1997), and learning organization assessment instruments (Redding, 1997).

Organizational learning research has not yet integrated recent thinking about the role of knowledge management in organizational learning. As learning is viewed as the catalyst for developing personal and organizational capabilities, and as knowledge management can facilitate organizational learning, it seems reasonable that these two streams of research could be integrated. However, organizational learning has not emphasized structured knowledge and the use of information technology to capture and leverage knowledge (Davenport & Prusak, 1998). Some feel that the organizational learning approach deals with knowledge in too abstract and conceptual a fashion for it to have a meaningful effect on how organizations achieve their objectives (Grant, 1996; Stewart, 1997).

Knowledge management. Knowledge management has been defined as the process of creating, capturing, and using knowledge to enhance organizational performance (Bassi, 1997). Knowledge management is most frequently associated with documenting and codifying individuals' knowledge and then disseminating it through such venues as a company-wide database. Knowledge management also includes activities that facilitate human exchanges through traditional methods such as conversations and written documents. The idea that knowledge, like physical resources, is an asset worthy of investment has roots in human capital theory. But only recently have methods been developed for sharing knowledge that are sensitive to its unique properties.

Knowledge was first proposed as the primary form of capital by Milan Zeleny (1989). He argued for a reversal of the trend toward the continuing specialization of knowledge in favor of more integrative and multifunctional systems of knowledge management. Using a similar argument for knowledge integration, Stewart (1997) advised managers to focus more on what they know, that is, their intellectual capital, than what they own. To support this reorientation, he provided a comprehensive set of tools for measuring and managing intellectual capital.

Three seminal works have brought knowledge management to the forefront of organizational research: Nonaka and Takeuchi's (1995) groundbreaking study of knowledge generation and use by Japanese companies; Leonard-Barton's (1995) detailed description of how leading manufacturing companies capitalize on their knowledge; and Davenport and Prusak's (1998) comprehensive examination of the challenges and opportunities of knowledge management. These works provide a realistic assessment of the cultural and technical requirements of developing a knowledge management system in today's competitive, resource-constrained business environment.

The Need for a Theory of Knowledge Management

This section presents three brief arguments for the need for a theory of knowledge management. Each argument is based on Campbell's (1990) synthesis of the roles of theory.

Defining applied problems. Theory provides a means for identifying and defining applied problems. Organizations pursuing knowledge management often look for the best way to use information technology for this purpose. Knowledge management quickly becomes a solution (that is, information technology) in search of a problem. Yet organizational theory tells is that successful initiatives must first be rooted in the pursuit of organizational goals. Meeting customer requirements or key business needs are core purposes for which knowledge management should be undertaken. When appropriate, information technology serves as a primary means for knowledge dissemination. Theory helps us relate means to goals.

Evaluating solutions. Theory provides a means for prescribing or evaluating solutions to applied problems. If knowledge management is seen as a way to more effectively achieve business goals, then the success of a knowledge management project is often defined by how quickly and how well the business goals were achieved. However, theory tells us that organizational performance outcomes are determined by multiple factors,

including the knowledge of employees. The relative contributions of these factors cannot be directly inferred from success in achieving the outcome. Conversely, when organizational goals are achieved this cannot be considered a direct consequence of knowledge management. Performance outcomes may be achieved despite marginal contributions from knowledge management. On the other hand, a knowledge management project may be quite successful despite the failure to achieve organizational outcomes.

Responding to new problems. Theory provides a means for responding to new problems that have no previously identified solutions strategy. With few precedents from which to learn, organizations implementing a system-wide project to codify and disseminate knowledge face a daunting task. Yet theory has identified the key cultural and technical variables that are critical to successful system-wide change. These include a clearly articulated, overarching purpose for knowledge management, top management commitment to this effort, flexibility that allows the knowledge management system to adapt to changing methods and needs, and a change philosophy that values continuous learning and improvement. Thus, theory provides the basis for responding to novel problems.

In short, a theory is needed to keep knowledge management aligned with the business goals it is supposed to serve. A theory of knowledge management helps identify criteria against which project success can be evaluated, even when organizational success is elusive. A theory of knowledge management also provides a means for responding to new, seemingly overwhelming, challenges in managing knowledge that, because they are new, have no previously identified solution strategies.

Dubin's Methodology for Theory Building

Dubin (1978) provides a comprehensive methodology for theory building that is particularly relevant for applied fields such as education and management. More so than other theory building strategies, Dubin's eight-phase methodology for theory building lays out an explicit roadmap for the theorist to follow. The methodology offered by Dubin, a well-known writer on theory and theory building, is frequently used as a template for building theories in the behavioral sciences. The eight phases of theory building are: (1) units (i.e., concepts) of the theory, (2) laws of interaction (among the concepts), (3) boundaries of the theory (the boundaries within which the theory is expected to apply), (4) system states of the theory (conditions under which the theory is operative), (5) propositions of the theory (logical deductions about the theory in operation), (6) empirical indicators (empirical measures used to make the propositions testable), (7) hypotheses (statements about the predicted values and relationships among the units), and (8) research (the empirical test of the predicted values and relationships). The first five phases of the methodology represent the theory building component of Dubin's model, and the last three phases represent the process of taking the theory into real world contexts to conduct empirical research. Although theorists must consider the entire scope of Dubin's model for effective theory building, theory building and empirical research are often separated, and each of these is conducted as a distinct research effort.

A Theory of Knowledge Management

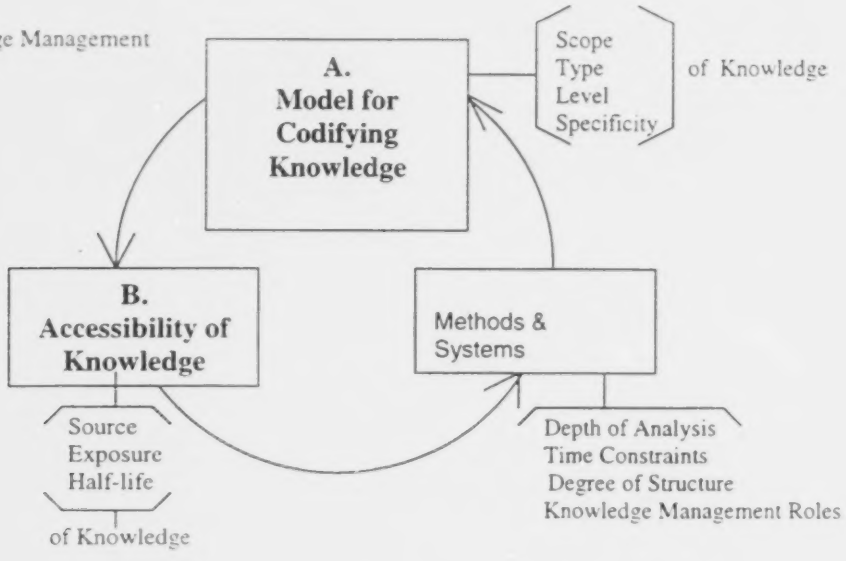
This section describes the development of the theory using the first five phases of Dubin's methodology for theory building.

Units of the theory. The units of the theory are the concepts, the building blocks, from which the theory is constructed. There are three basic units of the theory of knowledge management—a model for codifying knowledge, the accessibility of knowledge, and methods and systems for knowledge management. Each of these three units of the theory has several conceptual dimensions of its own that are described in the following sections. A model that represents the three units of the theory and the dimensions of each unit appears in Figure 1.

Model for Codifying Knowledge. Rather than attempt to describe what knowledge is, a task that has long intrigued the world's greatest thinkers and that is not yet resolved, a model for codifying knowledge is provided. This model facilitates decision making about what knowledge to share and how it should be shared. Accepting the lack of consensus on what knowledge is, the model reflects the simple tautology offered by Grant (1996) that knowledge is "what is known," and that there are many types of knowledge relevant to organizations. The model also emphasizes the role of the individual in creating knowledge that is consistent with Simon's observation that "all learning takes place inside individual human heads; an organization learns in only two ways: (a) by the learning of its members, or (b) by ingesting new members who have knowledge the organization didn't previously have" (1991, p. 125). The model described here is for codifying individual knowledge. The organization also supports individual knowledge creation and the sharing of knowledge among members. The role of the organization in

knowledge management includes establishing a climate of trust and support for sharing knowledge, developing the infrastructure for sharing knowledge, and other knowledge management roles discussed later in the paper.

Figure 1.
A Model of Knowledge Management



The model for codifying knowledge, adapted from Microsoft's "SPUD" system for profiling employees' knowledge (Cusumano and Selby, 1995), has four dimensions: (a) scope of knowledge, (b) type of knowledge, (c) level of knowledge, and (d) specificity of knowledge. (See Figure 1., A Model of Knowledge Management). The scope of knowledge is a four-tiered structure that addresses the range of an individual's knowledge. At the bottom level is foundational knowledge that is exemplified by entry-level competencies. The next level is knowledge that is unique to a particular job or role. An information systems analyst, for example, needs programming skills to diagnose problems in the system's operating codes. Next, knowledge can be functional in scope, a level that applies to all employees in a particular function or department. All employees in the accounting and finance area would be knowledgeable in financial analysis; every human resource professional would have expertise in matching employee performance with reward systems. At the top of the scope of knowledge structure is knowledge that is organization/industry in scope. This includes knowledge of the overall business the organization is in, the organization's strengths and weaknesses, the markets it serves, and the factors critical to the organization's success.

Within each of the four tiers of the scope of knowledge are two types of knowledge—explicit knowledge and tacit knowledge. Explicit knowledge is demonstrated through expertise in the use of specific tools and methods. Winter's (1987) taxonomic dimensions of knowledge distinguish explicit knowledge—knowledge that is articulable, observable in use, and independent of a broader system of knowledge, from tacit knowledge—that which is not articulated or observable in use. Winter cites Polanyi's classic observation about tacit knowledge that "*the aim of a skillful performance is achieved by the observance of a set of rules which are not known as such to the person following them*" (1962, p. 49, italics in original). "Not known as such" here means that the performer could not provide a useful explanation of the rules he/she followed to execute the performance. Thus, tacit knowledge, while available to the performer, is present at a deeper, unconscious level that cannot be articulated to others.

Within each type of knowledge there are also four levels of knowledge: (a) basic, (b) working, (c) leadership, and (d) expert. For a given type of knowledge, these levels can be specified in several statements that make the level clear and measurable. A person's level of knowledge can be rated by managers, peers, customers and others who are in a position to provide informed judgements about the person's level of expertise. Finally, the specificity of knowledge is an acknowledgement that an individual's knowledge can be from a specific domain or from multiple domains. For example, a high school principal has knowledge of theories of learning. This is knowledge drawn from a single domain. The principal is also knowledgeable about how to foster a high school environment conducive to learning through the use of resources and incentives for teachers. This knowledge is drawn from multiple domains including learning theory, performance management, and organizational change.

Accessibility of knowledge. The accessibility of knowledge is the degree to which knowledge is available to be shared throughout the system. The three dimensions of this unit of the theory are: (a) the source of knowledge, (b) the half-life of knowledge, and (c) the exposure of knowledge. (See Figure 1., A Model of Knowledge Management). The accessibility of knowledge is enhanced if the knowledge is consolidated and can be obtained from a single source of knowledge. Knowledge from a single, focused source is contrasted with knowledge that resides in several sources. Knowledge that is diffused among sources, especially sources of different types (for example, people, paper documents, and electronic media) is less accessible than knowledge from a single, focused source.

The half-life of knowledge is the time interval during which 50% of the knowledge will become obsolete and replaced by new knowledge. The novelty of new knowledge gives it visibility that, in the short-term at least, enhances access to this knowledge. Older knowledge, on the other hand, has the potential for a longer half-life by virtue of its age alone, but it must endure a longer period of scrutiny from emergent new ideas.

The exposure of knowledge is the degree to which knowledge is based on rules that are evident to the observer. Procedural knowledge can be directly inferred from the behavior of the performer (Bereiter and Scardamalia, 1993). This knowledge is easily represented by the observer from the sequence or manner of actions taken by the performer. This knowledge is more "exposed" to the observer than knowledge that is intuitive or conceptual in nature. Because conceptual knowledge is present at a deeper level, it is less exposed to observation. This is the "tacit knowledge" of Polanyi (1962).

Methods and systems for knowledge management. These are the strategies and techniques used to identify the knowledge and make it explicit and available to others. The four dimensions of this unit of the theory are (a) the depth of analysis, (b) the time constraints on managing knowledge, (c) the degree of structure in the methods/systems, and (d) the knowledge management roles. (See Figure 1., A Model of Knowledge Management).

The depth of analysis addresses the extent to which the knowledge management system makes the knowledge explicit to others. Detailed descriptions of one's working knowledge are communicated verbally in the stories and case examples people tell about their work, or in written form through research reports and other documents. On the other hand, a knowledge management system may simply identify the source of knowledge (for example, a person or document containing the knowledge) so that others can consult it directly. Knowledge mapping simply locates important knowledge in the organization and publishes this information in some kind of map or directory. The main benefit of knowledge mapping is in showing people where to go when they need expertise. Thus, the knowledge management system may present a detailed description of the knowledge itself (for example, presenting an on-line database or direct access to technical report) or direct the user to the source of knowledge using knowledge mapping. The depth of analysis, which is conceptually distinct from the depth of knowledge, is the extent to which the system makes the knowledge explicit.

The time constraints for finding solutions also determine the methods and systems used for knowledge management. Many circumstances allow time for search, reflection, and synthesis of knowledge. Others situations, particularly those involving customer service in which the customer needs assistance right away, require real-time performance. Methods conducive to rapid search and retrieval of knowledge are used in "help desk" applications that allow users to input data to classify the customer's problem and find a match between the problem and a solution selected from among pre-determined alternatives. This real-time system delivers domain-specific knowledge through case-based reasoning (CBR) technology (Kolodner, 1993). In situations not as constrained by time, methods for verbal or electronic exchange of knowledge (for example, e-mail or Lotus Notes) are more desirable.

The degree of structure of the methods and systems for knowledge management distinguishes between the methods best suited for archiving quantitative, structured knowledge and those best used for qualitative, unstructured knowledge. Structured content such as data on customers, products, prices, and specifications for service, warranty, and delivery fit well within relational database programs that give users desktop access. A database format allows information to be organized in several ways (for example, by customer or by product) with all the relevant data linked together. On the other hand, unstructured content such as the stories and experiences of experts, are best represented in web pages, Lotus Notes, and intranet technology, which allow users to shape their own narratives. Using a combination of structured and unstructured methods provides the flexibility to accommodate a broad range of knowledge, and prevents amorphous, tacit knowledge from being destroyed by being forced into rigid structures (Davenport and Prusak, 1998). The degree of structure in the knowledge management system is determined by the types of knowledge to be represented. This relationship is addressed in the next section by the theory's "laws of interaction."

Finally, knowledge management roles are necessary to initiate and manage the methods and systems for capturing and disseminating knowledge. Because knowledge resides in employees, it should be evident that all

employees, not just those charged with developing a knowledge management system, are responsible for sustaining the activities of knowledge management. While successful projects require people dedicated full-time to maintaining a dynamic knowledge management system, ultimately, the managers and workers who perform the organization's work (designing products, marketing, selling, managing resources) bear the responsibility for carrying out the day-to-day activities for managing knowledge. These people must be willing to share their knowledge and make use of the knowledge of others.

Laws of interaction. The relationships among the concepts (units) of a theory are described in the theory's laws of interaction (Dubin, 1978). The laws of interaction show how changes in one or more units of the theory influence the remaining units. Four laws of interaction govern the relationships among the units of the theory.

Especially for knowledge workers, knowledge rarely fits neatly into a single category of the "model for codifying knowledge." Despite our present inability to precisely describe and classify knowledge, organizations seek to capitalize on knowledge management to enhance innovation and learning. Thus, knowledge is both important and elusive. This dilemma is the basis for the theory's first law of interaction.

1. *All knowledge is unique and can be described in distinctive ways. A variety of methods exist for describing different types of knowledge. Systems for knowledge management must be founded on descriptions of knowledge using a model for codifying knowledge. (Therefore, the theoretical system represented in Figure 1., A Model of Knowledge Management, begins at box A and proceeds counter-clockwise around the model).*

For example, suppose an engineering manager assigns a small design project to a staff engineer. Although the staff engineer has produced similar designs in the past, the engineer needs data from recent technical reports to handle this design application. This means that some of the knowledge for this project resides in the engineer and some of the knowledge must be taken from recent publications. These are the primary sources of knowledge that determine its accessibility. To organize and standardize their work, engineers in this department have adopted a generic problem-solving model adapted to solving design problems. While some of their problem solving is rules-based and observable to others (for example, the diagram of a design problem and a list of alternative solutions), much of the engineers' knowledge is conceptual and not observable to others. These factors contribute to the degree of exposure of knowledge. Furthermore, the design project requires bringing together technology that has long been the industry standard with state-of-the-art engineering knowledge that has never been used in this application. These requirements define the half-life of knowledge for this project.

The type of knowledge needed by the staff engineer is described using the "model for codifying knowledge." The type of knowledge (that is, job/role in scope, domain-specific, both tacit and explicit) is needed to determine how accessible the knowledge is. This feature of knowledge is the basis for the theory's second law of interaction.

2. *The type of knowledge determines the accessibility of knowledge. (This is the relationship between box A and box B in Figure 1.). The accessibility of knowledge must be assessed before adopting the methods and systems that are most appropriate for knowledge management.*

The accessibility of knowledge determines what methods are used to make the knowledge available to others. Some of the knowledge used in the engineering example is non-observable (the engineering manager knowing which subordinate should be assigned the design project) and conceptual (the staff engineer's conception of how the new design project compares with past projects). This knowledge is not readily accessible to others. It is best shared through knowledge mapping and unstructured methods for knowledge exchange. Other types of knowledge, such as the procedure for making engineering assignments and the generic problem-solving method used by engineers, are rules-based and easier to communicate through structured methods, such as written procedures and models. This relationship between the accessibility of knowledge and the ways in which it is made available to others is the basis for the theory's third law of interaction.

3. *The accessibility of knowledge determines the choice of methods and systems for knowledge management. (This is the relationship between box B and box C in Figure 1.).*

All dimensions of a unit of the theory are considered together when determining how one unit relates to another unit of the theory. That is, we cannot take a single dimension of a unit and attempt to relate this dimension alone to another unit of the theory. For example, we may want to know how an organization's facilities are secured at the end of the day. A security guard may provide us with a list of security procedures, some of which require the guard to physically inspect and lock certain areas, and others involve electronic measures, such as setting the security alarm. Based on the exposure of knowledge alone, this would appear to be procedural knowledge, most of which can be observed. This knowledge is best captured with structured methods (for example, a list of sequential procedures written by the security guard).

However, the source of knowledge may not be limited to the security guard. Weekend security of the facility may be the responsibility of a security contractor or the police department, who may have different security procedures. Thus, the accessibility of knowledge is not simply a function of the security guard's procedures, a type

of rules-based knowledge that is easily exposed. The choice of method for sharing this knowledge must also take the multiple sources of knowledge into consideration. The need to consider all the dimensions of a unit of the theory is the basis for the theory's fourth law of interaction.

4. *The relationship of one unit of the theory to another unit is based on a composite assessment of the unit. The unit as a whole, not a single dimension, is considered with respect to how the unit relates to other units of the theory. (This law of interaction applies to all three units of the theory in Figure 1.).*

Boundaries. Dubin (1978) describes the boundaries of a theory as defining the domain over which the theory is expected to apply. The boundaries of a theory establish those aspects of the world the theory is modeling by distinguishing the theoretical domain from other aspects of the world not addressed by the theory.

The domain within which the theory is expected to hold is the domain of work. The distinction between work and all human activities separates the domain of the theory from non-work human activities not addressed by the theory. Within the domain of work, the theory applies to knowledge management. Because the theory addresses knowledge management performed in any organization that accomplishes work, there are no external boundaries specified for the environment. The theory applies to knowledge management regardless of the contextual factors of person, organization, time, or purpose.

System states. Dubin (1978) defines a system state as being a condition of the system being modeled in which all the units of the system take on characteristic values that have persistence through time, regardless of the length of the time interval. All units of the system have values that are determinant, that is, that are measurable and distinctive for that state of the system. A system state that accurately represents a condition of the system being modeled has three characteristics: (a) inclusiveness (all the units of the system—a model for codifying knowledge, the accessibility of knowledge, and methods and systems for knowledge management—are included in the system state), (b) persistence (the relationship between knowledge and method persists long enough to allow the goodness of fit between them to be determined), and (c) distinctiveness (all units take on unique values for that system state).

Propositions. Propositions of the theory are logical deductions about the theory in operation. Propositions of a theory are true because they are statements that are logically derived from the theory (Dubin, 1978). Propositions can then be subjected to empirical testing. Five propositions from the theory are specified next.

1. Leaders must identify the business goals to be served by a knowledge management project. A system for codifying and disseminating knowledge will not be sustained unless it is anchored in important business needs.
2. The importance of knowledge determines whether or not it should be included in the knowledge management project. The type of knowledge determines how it should be codified and disseminated. These are conceptually distinct issues that should be determined in this sequence.
3. Knowledge should be standardized (i.e., modified by substituting common terminology) and edited for just enough uniformity to allow the knowledge management system to work. The distinctive character of local knowledge must be preserved while making the knowledge available for widespread dissemination.
4. An optimal match can be achieved between the type of knowledge and the methods used to make it explicit. This is a matter of achieving fit between the knowledge, its accessibility, and the systems for sharing it.
5. The system for knowledge management is developed in such a way that it can change as rapidly and flexibly as the knowledge itself.

Implications for Future Research

Future research is needed to assess the theory in the real world through empirical research. The last three phases of Dubin's methodology are used to conduct empirical research. For this the researcher specifies empirical indicators to make the propositions testable, states hypotheses about the predicted values and relationships among the units of the theory, and conducts research to empirically test the predicted values and relationships. In short, the theory of knowledge management needs to be tested through empirical research.

Future research is also needed to assess the domain over which the theory rightfully applies. The concepts (units of the theory) from which the theory was developed are drawn heavily from private-sector and corporate models of organizations. The terms business, industry, product, customer, marketplace, and other private-sector concepts appear throughout this paper. The theory proposes that a knowledge management system draws its purpose from meeting a business need. What about community, government, non-profit and other non private-sector organizations whose mission and performance are assessed differently than those of private-sector organizations? Does the theory of knowledge management apply in these contexts as well? Testing the theory in non private-sector settings is needed to identify the domains over which the theory applies and does not apply. If the theory does not explain knowledge management relationships in non-profit settings, then it may be modified to do

so. Otherwise, its scope and boundaries should be altered to reflect its exclusive application to private-sector organizations. In short, research is needed to assess the relevance and applicability of the theory.

References

Anderson, J. R. (1982). Acquisition of cognitive skill. Psychological Review, 89(4), 369-406.

Bassi, L. J. (1997). Harnessing the power of intellectual capital. Training and Development, 51(12), 25-30.

Becker, G. S. (1993). Human capital: A theoretical and empirical analysis, with special reference to education (3rd ed.). Chicago: University of Chicago Press.

Bereiter, C. & Scardamalia, M. (1993). Surpassing ourselves: An inquiry in the nature and implications of expertise. Chicago: Open Court.

Chi, M. T. H., Glaser, R. & Farr, M. J. (1988). The nature of expertise. Hillsdale, NJ: Lawrence Erlbaum.

Cusumano, M. A. & Selby, R. W. (1995). Microsoft secrets: How the world's most powerful software company creates technology, shapes markets, and manages people. New York: Free Press.

Davenport, T. H. & Prusak, L. (1998). Working knowledge: How organizations manage what they know. Boston: Harvard Business School Press.

Dechant, K., Marsick, V. J. & Kasl, E. (1993). Towards a model of team learning. Studies in Continuing Education, 15(1), 1-14.

Dubin, R. (1978). Theory building (2nd Ed). New York: Free Press.

Ericcson, K. A. & Smith, J. (1991). Prospects and limits of the empirical study of expertise: An introduction. In K. A. Ericcson & J. Smith (Eds.), Towards a general theory of expertise: Prospects and limits. Cambridge: Cambridge University.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic Management Journal, 17(Special Issue), 109-122.

Herling, R. W. (1997). Expertise: The development of an operational definition for human resource development. In R. J. Torraco (Ed.), Academy of Human Resource Development Proceedings, 28.1-29.9.

Holton, E. F. III. (1999). Performance domains: Bounding the theory and practice. In R. J. Torraco (Ed.), Advances in Developing Human Resources, 1(1), 11-20.

Kolodner, J. (1993). Case-based reasoning. San Mateo, CA: Morgan Kaufman.

Kuchinke, K. P. (1997). Employee expertise: The status of the theory and the literature. Performance Improvement Quarterly, 10(4), 72-86.

Leonard-Barton, D. (1995). Wellsprings of knowledge: Building and sustaining the sources of innovation. Boston: Harvard Business School Press.

Lewis, D. R. (1977). An introduction to the economics of education. In W. G. Meyer (Ed.), Vocational education and the nation's economy. Washington, DC: American Vocational Association.

Nevis, E. C., DiBella, A. J. & Gould, J. M. (1995). Understanding organizations as learning systems. Sloan Management Review, Winter, 73-85

Nonaka, I. & Takeuchi, H. (1995). The knowledge-creating company. New York: Oxford University Press.

Polanyi, M. (1962). Personal knowledge: Towards a post-critical philosophy. New York: Harper Torchbooks.

Redding, J. (1997). Hardwiring the learning organization. Training and Development, 51(8), 61-67.

Robinson, A. & Stern, S. (1997). Corporate creativity. San Francisco: Berrett-Kohler.

Senge, P. M. (1990). The fifth discipline. New York: Doubleday Currency.

Schultz, T. W. (1961). Investment in human capital. American Economic Review, 51(1), 1-17.

Schwandt, D. R. (1995). Learning as an organization: Journey into chaos. In S. Chawla and J. Renesch (Eds.), Learning organizations: Developing cultures for tomorrow's workplace. Portland, OR: Productivity Press.

Simon, H. A. (1991). Bounded rationality and organizational learning. Organization Science, 2, 125-134.

Stewart, T. A. (1997). Intellectual capital: The new wealth of organizations. New York: Doubleday-Currency.

Watkins, K. & Marsick, V. (1993). Sculpting the learning organization. San Francisco: Jossey-Bass.

Winter, S. G. (1987). Knowledge and competence as strategic assets. In D. J. Teece (Ed.), The Competitive Challenge. Cambridge, MA: Ballinger.

Zeleny, M. (1989). Knowledge as a new form of capital. Human Systems Management, 8(1), 45-58.

Signposts on the Road to Knowledge Management

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Knowledge management (KM) is what an organization does to take its intellectual resources, both obvious and subtle, and make them fresh, meaningful, and accessible. What is KM and why is it important to HR professionals? What is the status of KM in organizations and HR and training units? Are consulting firms leading the way? These questions were investigated in this paper.

Keywords: Knowledge Management, Human Resource Profession, Performance Consulting

Knowledge Management (KM) involves recognizing, documenting, and distributing the explicit and tacit knowledge resident in an organization's workforce and customers. The mission is to provide the right information to the right people at the right time (Stewart, 1997c; Davenport & Prusak, 1998; O'Dell & Grayson, 1998). As good an idea as it is, knowledge management is far from guaranteed. To bring it about, both individuals and organizations are pressed to engage in new ways of thinking and acting (Davenport & Prusak, 1998; Agor, 1997; Stewart, 1997c). Knowledge management relies upon executive sponsorship, organizational policies, targeted technologies and individual and cross-functional generosity and energy. Bringing system and certainty to KM calls upon human resources professionals to engage in initiatives akin to the strategic directions encouraged by Ulrich (1997), Wognum (1998), and Rossett (1999). Are human resources and training professionals ready? What roles are these professionals now playing as regards KM? This preliminary study sought their views about KM in their units and larger organizations.

The Focus on Knowledge Management

Evidence of the contemporary interest in knowledge management is plentiful. In 1996 alone, there were at least six major conferences focusing on the subject. In the last three years, three journals dedicated to knowledge-related topics have emerged. A web site, www.brintcom, has grown like topsy. Knowledge management is beginning to happen:

- The World Bank identifies knowledge management as an "urgent necessity" for global development, and is spearheading knowledge-management initiatives in Third World countries (Lakewood Publications, 1998).
- Andersen Consulting has leveraged the knowledge of their worldwide workforce through its Knowledge Xchange system, a Lotus Notes-based system that allows storage of software code that can be re-purposed, templates for reports or budgets, summaries of literature read by consultants and relevant to the industry, employee profiles, and anecdotal experiences with challenges and customers. At the moment of need, wherever and whenever, Andersen employees can access people, examples, presentations, and data (Stewart, 1997c).
- Chevron Corporation sets up Best Practice Teams throughout the corporation. The team that shares knowledge related to energy-use management saved Chevron $150 million on its annual power and fuel bill (Martinez, 1998; O'Dell & Grayson, 1998).

Moving to Knowledge Management

While some are engaged in KM efforts, initiating KM in an organization is a challenge. Research conducted by The American Productivity & Quality Center (APQC) revealed that specific successful practices would typically linger in a company for years, unrecognized and unshared. However, even when recognized, it took over two years on average before other sites within a company began to actively adopt the practice, if at all (Szulanski, 1995).

The nature of knowledge is one reason it is difficult to move an organization to KM. Consider knowledge as "a fluid mix of framed experience, values, contextual information, and expert insight" (Davenport & Prusak, 1998 p. 5). Allee (1997) further notes that knowledge is "messy."

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While the meaning of knowledge is at the heart of the challenge, there is little the human resources professional can do about definition. Thus we have chosen to look at five other influential levers which are, though formidable, more within the ken of human resources and training professionals: culture and policies; access to information; technologies; knowledge management as priority; and learning about KM.

Organizational Culture and Policies

Davenport and Prusak (1998) describe the first step in any knowledge initiative as recognizing there are markets for knowledge. This involves an attempt to propel employees to want to put their 'knowledge products' on the shelves. Some employees will feel they are being asked to give away for free that which they have come to perceive as their own valuable possession or that which distinguishes them and provides job security.

Thomas Stewart (1997b) poses a question that gets at the ripeness of the culture for KM: "When you return from a convention, which do write up first, your expense account or your trip report? Which contains more creative thinking? Which is read more attentively" (p. 160)?

Access to Information

According to Stewart (1997c), it is critical to "connect people to data, experts, and expertise" when they perceive a need (p.132). Hewlett Packard provides an example. HP has established a database comprised of HP Frequently Asked Questions (FAQs) databases. This enables employees to anticipate customer and employee concerns and repurpose and tailor responses.

Enabling Technologies

Technology is critical for KM, but not sufficient. Daveport and Prusak (1998) put it like this, "It's usually much harder to get organizational consensus for behavior change and new roles than it is for technology–and if you start with technology, the other necessary factors may never materialize"(p. 166).

Learning About KM

In a 1997 review of 70 knowledge management projects, the American Productivity and Quality Center (APQC) found that only two projects involved training staff or human resource managers regarding their roles in KM initiatives. Carla O'Dell, APQC President, states "To the extent that training implies classical job skills, you might expect it to be out of the loop. But to the extent that training is supposed to be part of team-building and change management, you'd think it should be very involved" (Stamps, 1997, p. 44).

Study Purpose and Methodology

Extracting, packaging, and distributing information is not new ground for human resource and training professionals (Rossett & Gautier-Downes, 1991; Gery, 1989; Hackos & Stevens, 1997). This preliminary study pursued the authors' curiosity regarding how far beyond job aids and documentation the profession has come, investigating the knowledge management practices reported by volunteer respondents. Based upon the five KM-influencing levers identified in the literature, we assessed readiness associated with knowledge management to tease out progress towards the systems and goals associated with KM. Additionally, we sought to understand the roles human resource and training professionals reported themselves to be playing in KM. Were they supporting larger knowledge-related initiatives and setting the pace through their own departmental practices? Were consulting firms leading the charge towards KM, as suggested by the literature?

Methodology

Instrumentation

A review of the literature identified key factors associated with the management of knowledge in organizations. These factors were transformed into a 44-question survey. The instrument included 29 questions focused on KM-related practices within the organization at large and 15 similar questions related to the respondent's unit. The majority of questions asked individuals to indicate the regularity of different KM practices and activities on a three-point Likert scale. We asked for ratings regarding items like: "Our people tend to generously share their ideas," and "Our people have systems to find the right person."

Sample and Data Collection Procedures

The survey was distributed to human resources, training and performance technology professionals who were voluntary attendees at a national conference featuring topics of interest to individuals in human resources and training occupations. An opportunistic sampling strategy was employed to collect responses from 122 individuals during March of 1998. The survey took about ten minutes to complete. The greatest participation was from individuals representing financial service/insurance (16%), manufacturing (16%) and consulting firms (13%). Thirty-three percent classified themselves as instructional designers, 30% as managers or executives, and 28% as performance technologists.

Data Analysis

A Cronbach alpha measure of reliability using SPSS was used to analyze the 26 3-point Likert scale questions associated with the organization at-large. Based upon the reliability analysis, two questions were eliminated, resulting in a scale of 24 questions with an alpha coefficient of .86. -tests were then conducted to determine differences between industry groups and the presence of a formal technology-based KM system. Differences between the organization at-large and the respondents' individual units were analyzed using paired *t*-tests.

The limitations of this preliminary study and analysis should be noted. In particular, an opportunistic sampling strategy was employed to obtain a small *n*. Additionally, the study is exploratory rather than hypothesis-based. Analysis to identify individual scales and increase reliability based on the five domains identified in the literature is being conducted for future reporting.

Results

Results of this study suggest that knowledge management is not yet pervasive in the view of respondents. There is, however, evidence of positive movement.

Formal KM Systems in Organizations

Eight percent of respondents admitted that knowledge was not captured in their organization. Sixty-nine percent worked for organizations that record *some* knowledge such as best practices or lessons learned. Of those reporting the capture of knowledge, 42% commit knowledge to a paper format and 27% to technology-based systems. Just 16% of the total sample worked for an organization where people "collaborate using a technology-based system that captures and provides access to knowledge."

Responses from individuals representing consulting firms mirrored published reports that these organizations are leading the way in knowledge management activities. According to these respondents, half of their firms use a technology-based system to capture and provide access to knowledge, compared to just 12% for the remainder of the sample.

Organizational Commitment and KM

To understand where organizations stand on the road to knowledge management, a mean was calculated for responses to 24 questions about KM-influencing practices in the respondents' organizations. This mean is based on a three-point scale, with 1=rarely, 2=occasionally, and 3=typically. The scale included questions related to customer-focus, knowledge sharing, organization culture, technology information systems, and learning activities and practices. The total sample realized a mean score of 1.98, suggesting that KM-related activities occur occasionally. Individual mean scores ranged from a low of 1.37 to a high of 2.65.

Items 13 and 14 asked respondents to report whether or not their organizations had people and technology devoted to capture, distribute and maintain knowledge systems. If organizations had such formal indicators as technology and staffing in place, does it correlate to other KM elements? The association with an extant KM system proved significant, with a mean of 2.12 for organizations with a KM system, versus 1.91 for those without (t=4.085, p=.000). Table 1 presents this analysis.

Table 1

Results of t Test using Organization Scale between Organizations With and Without Formal Knowledge Management Systems

Group	*Mean Score*	*t Value*	*2-tail Probability*
Organization KM Score			
With KM System *(n=55)*	2.12	4.085	.000
Without KM System *(n=65)*	1.91		

KM by Industry

Many real world examples of KM come from consulting firms, either in their internal efforts or in projects for their clients. Are they really further along the road on knowledge management than others? This question was initially supported by the fact that consulting firms were four times more likely to have a formal KM system comprised of staff and technology when compared to all other represented industries. A *t*-test for independent groups compared the mean organization KM score of the consulting firms to the remainder of the sample. Table 2presents the significant differences between the two groups, perhaps providing signposts for professionals who seek to nudge their organizations towards KM.

Table 2

Results of t Test between Consulting Firms and All Other Organizations

Group	*Mean Score*	*t Value*	*2-tail Probability*
Organization KM Score			
Consulting Firms *(n=16)*	2.30	-5.377	.000
All others *(n=106)*	1.93		

In what specific areas have consulting firms moved ahead? Table 3, a *t*-test for independent groups, provides the mean scores by item for the subset of questions with significant differences in responses between consulting and non-consulting groups.

HR Leadership in KM

While consulting firms are featured in the published KM literature, HR and training professionals have a much lower profile in those reports. We anticipated a leadership role, since many of the concepts associated with KM are familiar and congruent (Ulrich, 1997). Would HR and training units report more KM activities and initiatives in their home units than in the organization at large? A paired *t*-test was performed to compare individual unit practices to those of the organization. Table 4 presents differences between the two entities.

Discussion

Providing KM Leadership

Respondents believe they are more customer focused than the larger organizations in which they reside. They also credit themselves with finding resources and linking those resources to needs. In addition, they report themselves to be knowledge workers who generously share their ideas. While these attributes are laudable, they also reside in rather close proximity to typical human resource roles. Strong KM leadership will likely require human resource and training units to go beyond their conventional ken to forge new and flexible partnerships with MIS and customers.

Consulting Firms as Pioneers

As suspected, consulting firms are further along the KM path as evidenced by significantly higher ratings on questions about unrestricted access to information, supportive knowledge systems, and encouragement for communities of practice. Individuals from consulting firms are more likely to perceive themselves as knowledge workers and to point to incentives and reduced command and control management practices. Why? Perhaps it is the independent and even isolated status of some consultants who find themselves in Kuala Lumpur, Buenos Aires, or Boise, where each consultant depends upon ready access to ideas, examples and systems that increase the value they add to the customer.

Table 3

Results of Independent Samples t Test for Questions with Significant Differences Between Consulting Firms and All Other Organizations

Question	*Non-Consulting Firm Respondents (n=106)* Mean	*Consulting Firm Responses (n=16)* Mean	*t-value*	*significance*
Our people have a good sense of what a knowledge worker is.	1.71	2.44	t = -3.580	p = .000
Our people consider themselves knowledge workers.	1.91	2.75	t = -3.821	p = .000
Our people tend to generously share their ideas.	2.08	2.63	t = -3.081	p < .003
People in our organization are allied with their professions and communities of practice even more than with our company or organization.	1.76	2.33	t = -2.851	p < .005
Our people self-assess in order to get a fix on directions for growth.	1.73	2.33	t = -2.928	p < .004
Our people have systems to find the right person, obtain quick answers, weigh alternative approaches, and examine numerous examples.	1.70	2.63	t = -5.143	p = .000
Our managers and supervisors have shifted their command and control perspectives to better suit how knowledge workers approach their work.	1.68	2.44	t = -4.262	p = .000
When a manager seeks to reduce access to information, he or she must justify the restriction.	1.55	2.40	t = -3.775	p = .000
Our people are expected to spend time learning as much as they can about our customers.	1.94	2.60	t = -3.095	p < .002
Our customers can point to examples of how we use our knowledge of their needs to customize the products and services we create for them.	1.92	2.69	t = -3.768	p = .000
We actively educate our customers about our business.	2.25	2.75	t = -2.897	p < .004

Table 4

Results of the Paired t Tests Between KM-Related Organization and Unit Activities (n=122)

	Question	*Mean*	*t-value*	*significance*
Org	Our people consider themselves knowledge workers.	2.03	t = -6.397	p = .000
Unit	We consider ourselves knowledge workers.	2.54		
Org	We use both instructor-led classes and technology-based learning experiences as the primary means to develop the skills our people need.	2.41	t = -1.070	p < .287
Unit	We use both instructor-led classes and technology-based learning experiences as the primary means to develop the skills people in our organization need.	2.48		
Org	Our people tend to generously share their ideas.	2.15	t = -6.748	p = .000
Unit	We tend to generously share our ideas.	2.61		
Org	Technology in our organization is keeping up with our information needs.	2.00	t = -2.657	p < .009
Unit	Technology keeps up with our needs.	2.14		
Org	Our people have systems to find the right person, obtain quick answers, weigh alternative approaches, and examine numerous examples.	1.82	t = -6.082	p = .000
Unit	We can find the right person, obtain quick answers, weigh alternative approaches, and examine numerous examples.	2.28		
Org	Our people spend more time with our customers than with each other.	1.84	t = -2.756	p < .007
Unit	We spend more time with our unit's customers than with our own people.	2.09		
Org	Our customers can point to example of how we use our knowledge of their needs to customize the products and services we create for them.	2.15	t = -3.418	p < .001
Unit	Our unit's customers can point to examples of how we use our knowledge of their needs to customize the products and services we create for them.	2.37		
Org	We have long-term relationships and repeat business with our customers.	2.76	t = .780	p < .437
Unit	We have long-term relationships and repeat business with our unit's customers.	2.72		
Org	Customer feedback is captured and used to improve what we already do.	2.30	t = -1.364	p < .175
Unit	Customer feedback is captured and used to improve what we already do.	2.40		
Org	Customer feedback and needs are used to generate new initiatives.	2.28	t = -1.364	p < .175
Unit	Customer feedback and needs are used to generate new initiatives.	2.38		

Commitment Counts

Dabbling in KM is futile. The literature trumpets this point and it is supported by this study. When responses to KM technology and personnel allocation are combined to represent organizational commitment,

significant differences appear. The organizations that invest in both the people and the technology are the ones that are moving to KM.

A Long Row to Hoe

While sixty-nine percent of respondents report that they are capturing some knowledge, only sixteen percent report a collaborative technology-based system. An example of the need for improvement relates to an item about access to information. In most organizations the default is restricted access, an obvious barrier to KM. Another example is managerial command and control. Regardless of the importance the literature places on shared decision-making for knowledge workers, respondents in this study say it is not yet typical in their settings. A final example is provided by a large positive response to our query about information overload. The perception of overload is antithetical to a KM system, where meaningful structure and access is key.

Forward Steps

All is not gloomy. Consulting firms are defining the way, followed surprisingly closely by a small but significant utility company response. Overall, respondents report that individuals in their organizations are taking more responsibility for their own professional planning and development. They also acknowledge transition to instructor and technology delivered professional development, perhaps a tentative step towards a technology knowledge base, so much a part of any KM system.

With prior impetus from the quality and performance technology movements (Deming, 1993; Stolovich & Keeps, 1992; Rossett, 1999), these human resource and training professionals report a healthy customer focus. They go beyond paying attention and listening to an active quest for, and use of, customer feedback.

Conclusion

People who work with things or deliver non-professional services will have fallen from 83 percent of the working population in 1900 to 41 percent by the year 2000. Those who primarily work with information were 17 percent of the workforce in 1900, and will be 59 percent at the turn of the century (Stewart, 1997c, p.40). How will human resource professionals respond to this change? Will departments and professionals model the shift to KM? Or will MIS shape KM initiatives because technology is a blatant and critical element of the shift? This exploratory study suggests that while there are some reasons for optimism, much remains to be done.

References

Agor, W. H. (1997, Summer). The measurement, use, and development of intellectual capital to increase public sector productivity. *Public Personnel Management, 26,* 175-86.

Allee, V. (1997). *The knowledge evolution: Expanding organizational intelligence.* Newton, MA: Butterworth—Heinemann.

Davenport, T. H. & Prusak, L. (1998). *Working knowledge: How organizations manage what they know.* Boston: Harvard Business School Press.

Deming, W. E. (1993). *The new economics for industry, government, education.* Cambridge, MA : Massachusetts Institute of Technology, Center for Advanced Engineering Study.

Hackos J. T. & Stevens D. M. (1997). *Standards for online communication. New York: John Wiley & Sons, Inc.*

Lakewood Publications. (1998). Third world KM: The best place to start? *Online Learning* [On-line serial], *1* (39). www.ollo98.com/resource/newsletters/content.htm

Martinez, M. N. (1998, February). The collective power of employee knowledge. *HRMagazine, 43,* 88-92.

O'Dell, C., & Grayson, C. J., Jr. (1998). *If only we knew what we know.* New York: The Free Press.

Rossett, A. (1999). *First things fast: A handbook for performance analysis.* San Francisco: Jossey-Bass/Pfeiffer.

Rossett, A. & Gautier-Downes, J. (1991). *A handbook of job aids.* San Diego, CA: Pfeiffer.

Stewart, T. A. (1997a, December 8). Grab a pencil—it's a knowledge quiz. *Fortune, 136,* 241-242.

Stewart, T. A. (1997b, June 23). Why dumb things happen to smart companies: Symptoms of bad brainpower management. *Fortune, 135,* 159-160.

Stewart, T. A. (1997c). *Intellectual capital: The new wealth of organizations.* New York: Doubleday.

Stolovich, H. D., & Keeps, E. J. (Eds.). (1992). *Handbook of human performance technology.* San Francisco: Jossey-Bass.

Szulanski, G. (1996, Winter). Exploring internal stickiness: Impediments to the transfer of best practices within the firm. *Strategic Management Journal, 17,* 27-43.

Ulrich, D. (1997). *Human resource champions: The next agenda for adding value and delivering results.* Boston: Harvard Business School Press.

Wognum, I. (1998). HRD policymaking in companies: An interpretation of the differences. *Human Resources Development Quarterly, 9* (3), 255-269.

The Relationship Between Human Resource Development and Business Strategy in 1998 Fortune 500 Companies

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Human resource development (HRD) professionals are increasingly expected to align their activities with the business strategy of the organization. However, not all organizations have the same strategy or the same needs. The focus of this study was to determine if significant relationships exist between business strategy and HRD. The sample for this study was 52 1998 Fortune 500 companies. The results indicate that significant relationships do indeed exist between business strategy and HRD.

Keywords: Strategy, Human Resource Development and Strategy

Organizations that wish to attain or retain a competitive advantage in the increasingly changing global market must ensure that the focus of their human resource (HR) function is strategically aligned with their business strategy (Hamel & Prahalad, 1994). Nadler and Tushman (1992) state that strategy comprises the decisions that allocate scarce resources against the constraints and opportunities of a given environment, specifically choices of markets, offerings, technology, and distinctive competence. Business-level strategy is primarily focused on the question, "How are we going to compete?". The most prominent business strategy typology that has been studied and validated extensively (Bird & Beechler, 1995; McDaniel & Kolari, 1987; Shortell & Zajac, 1990) is that of Miles and Snow (1978, 1994) which offers three ideal types of business strategy: 1) Defender (focused primarily on cost efficiency); 2) Prospector (focused primarily on innovation); and 3) Analyzer (focused primarily on quality).

In the globally competitive, technologically-advanced market where brain power and human resources are an organizations greatest asset (Thurow, 1997), HRD is increasingly expected to link their programs with the business strategy of the firm. Combining strategy and human resource development activities has become a vital source of competitiveness for all organizations (Ulrich, 1998). Rather than promote a dichotomy between business strategy and the development of individuals, products, or services, organizations must integrate these activities to create a sustainable competitive advantage (Seibert, Hall, & Kram, 1995).

Empirical research has shown support for a contingency perspective of strategic HR practices suggesting that the linear implications of a universal, or "best practices," perspective are too simplistic and that effective HR practices are actually contingent upon the business strategy of the firm. Several conceptual models have been introduced that address the human resource function in contingent relation to business strategy and other organizational characteristics. One such model is provided by Beer, Eisenstat, and Biggadike (1995) which provides a diagnostic model of organizational alignment and adaptability.

Theoretical Perspective

The theoretical perspective underlying this study falls within economic theory, specifically human capital theory. Several authors have addressed economic theory as it relates to business strategy, functional business units, and/or human resource development (Delaney, 1996; Jackson, Schuler, & Rivero, 1989; Weinberger, 1998). From micro economics, human capital theory suggests that people possess the knowledge, skills, and abilities that provide economic value to firms (Miles & Snow, 1995; Weinberger, 1998; Youndt, Snell, Dean, and Lepak, 1996).

An investment in human capital is a source of sustainable competitive advantage for firms (Thurow, 1997) and effective management of human capital, not physical capital, may be the ultimate determinant of organizational performance (Reich, 1991). Assuming heterogeneity among firms with respect to their human capital, competitive advantage is possible if a firm insures that its people add value to its production processes and that its pool of human capital is a unique resource, both difficult to replicate and difficult to substitute (Huselid, Jackson, and Schuler, 1997). Specifically, Huselid et al. state that firms can use training to insure the unique skills needed in their human capital to be competitive.

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Traditionally, HRD has been seen as an expense rather than an investment, but as human capital becomes more valuable economically and natural resources less important (Thurow, 1997), HRD has increased pressure to show its value to the organization. The problem with most common types of HRD programs is that they are seen as solutions in and of themselves, rather than as parts of an overall system to support the business strategy (Cocheu, 1992). Often, it seems HRD programs are implemented with little intentional consideration for the competitive strategy of the organization making it difficult to show the value of the programs as investments in the future success of the firm.

With little empirical evidence on the nature of the relationship between competitive strategy and HRD practices, organizations have little guidance on HRD practices that will likely support their business strategy, increase the value of their human capital, and provide a source of sustainable competitive advantage. This study took a necessary step in beginning to understand this relationship.

The purpose of this study was to identify if a significant relationship exists between business strategy and HRD practices. The variables used to measure HRD activity were primarily based on McLagan's (1996) definition of HRD and were chosen because they provide a broad overview of the HRD function. The following research questions guided the study:

1. What is the relationship between business strategy type and the extent of emphasis on various types of training?
2. What is the relationship between business strategy type and the extent of emphasis on various job categories (e.g. executive) of recipients of training?
3. What is the relationship between business strategy type and the amount of training required by the company (e.g. Motorola's 40-hr training requirement)?
4. What is the relationship between business strategy type and the types of organization development (OD) interventions?
5. What is the relationship between business strategy type and the extent of emphasis on various levels of organization development (OD) interventions?
6. What is the relationship between business strategy type and HRD dollars per employee?
7. What is the overall relationship between business strategy and the HRD function?

Method

Research Design

A multiple method descriptive design that was primarily quantitative and correlational in nature was used in this study. The sample for the study was 52 companies from the 1998 Fortune 500 listing of the 500 largest U.S. companies by annual revenue. Instrumentation included a mail questionnaire (with a fax and e-mail version) and a telephone interview guide. A survey was the major method of data collection used by the researcher with an amalgamation of mail questionnaire and phone interview.

Data analysis included basic descriptive statistics, analysis of variance, discriminant function analysis, and content analysis. The statistical analyses was used to identify significant relationships while content analysis was used to identify themes that supported or added to findings from statistical analysis for a more complete description of these relationships.

Population and Sample

The population for this study was all 1998 Fortune 500 companies. This population was chosen because they represent the largest organizations in the U.S. for a broad base to gather a representative sample of the business strategy types in Miles and Snow's typology. This population also consisted of companies that were performing well and were large enough to have substantive HR departments with an active HRD function to provide rich, descriptive data necessary to identify significant relationships between business strategy and HRD.

A purposive sampling technique was used to establish a sampling frame of 178 companies. Because it was essential to this study to have a representative portion of the sample identified within each strategy type, an expert panel was used to establish the sampling frame. Ninety companies were contacted by phone and 52 were willing to participate in the study. Of the 52 that were willing to participate, 18 were defenders, 16 were analyzers, and 18 were prospectors. This sample assured that at least 15 companies were represented in each strategy type which was necessary to meet minimum requirements of the statistical analyses.

Twenty different industries were represented in the study, and no specific industry comprised more than fifteen percent of the total sample. The industries represented were: 1) aerospace, 2) auto, 3) banking, 4) chemicals, 5) consumer products & services, 6) durables, 7) electronics, 8) energy, 9) financial, 10) food & beverage, 11) health, 12) insurance, 13) materials & construction, 14) media, 15) mining & metals, 16) retailers, 17) technology, 18) telecommunications, 19) travel & transportation, and 20) utilities. The food & beverage industry comprised fifteen percent of the total sample, retailers comprised twelve percent of the total sample, and energy and technology each comprised approximately ten percent of the total sample. All of the companies had more than 3,500 employees with a range of 3,500 to 850,000 employees. Annual revenue ranged from approximately $3 billion to $120 billion while annual profit ranged from approximately $2 million to $3.8 billion.

No industry comprised more than twenty-two percent of companies in any business strategy subgroup. Companies in the retail industry comprised twenty-two percent of defenders, while companies in the technology industry comprised twenty-two percent of prospectors. Analyzers did not have a notable percentage of companies in any one industry. Average breakdowns by business strategy subgroup are provided in Table 1.

Table 1
Description of Sample by Business Strategy Subgroup

	n	Avg. Fortune 500 Rank	Avg. Annual Revenue ($ in millions)	Avg. # of Employees	Avg. Annual Profit ($ in millions)
Defender	18	142	20,893	114,947	967
Analyzer	16	145	15,107	79,376	519
Prospector	18	135	13,705	36,044	1,535

Instrumentation

Two primary instruments were used in this study: 1) a mail questionnaire; and 2) a telephone interview guide. The mail questionnaire was designed to record quantitative data focusing first on general department information, then information related specifically to training, next OD information, then overall HRD and business strategy information. This questionnaire was available in fax, e-mail, and regular mail forms, although participants only requested fax and e-mail versions. The questionnaire was designed to take 10-15 minutes to complete and included close-ended questions and requests for numerical data.

The telephone interview guide was designed in two sections. The first section was designed to introduce the study, while the second section was designed to guide follow up questions after completion of the questionnaire to solicit primarily qualitative information through open-ended questions. The interview was also designed to take 10-15 minutes and included a code number corresponding with the mail questionnaire code. Both instruments were pilot tested with 3 companies similar to those in the final sample.

Data Collection

The major method of data collection in this study was a survey, including an amalgamation of a mail questionnaire and phone interview. Data collection took place from July 15, 1998 through November 20, 1998.

The researcher located HRD manager contact information from either the ASTD, ISPI, AHRD, or SHRM membership directories. HRD managers were considered managers or directors of corporate departments such as training and development, corporate education, and performance development. These managers were in a position in which they were both aware of the business strategy of the company and also had oversight of company HRD practices, thus were able to provide accurate information regarding both variables.

Data collection began by contacting the HRD managers by phone, then explaining the purpose of the study, why and how they were selected, the limited time commitment involved, and asked for their participation in the study. Upon agreement to participate, the researcher either faxed or e-mailed the questionnaire directly to the participant with a note attached indicating the agreed upon date and time for the follow up interview. After the participant's answers were recorded on the questionnaire and contact was made for the follow up interview, the researcher then proceeded to ask the questions on the interview guide over the phone while recording the participant's answers on the interview guide. If the participant or researcher deemed it necessary to gather information from another source, the researcher gathered contact information for that source, repeated the process, then combined the data.

Data Analysis

Data analysis included the use of basic descriptive statistics, analysis of variance (ANOVA), discriminant function, and content analysis. Basic descriptive statistics were used to provide a profile of each strategy type and its corresponding aggregate measures across the HRD variables. The researcher then used one-way ANOVA with a Scheffe post hoc multiple comparison analysis to determine whether the business strategy types differed significantly among themselves on the HRD variables being studied.

Discriminant function analysis was then used to determine if the HRD variables found significantly related to business strategy type in the ANOVA could reasonably predict membership in either the defender, analyzer, or prospector business strategy type. Sapsford & Jupp (1996) report that social scientists see discriminant function analysis as a very useful analytical tool because it can be used both to predict the group to which a person or 'case' might belong on the basis of a set of characteristics which that person or case holds, and to identify which variables are most powerful in distinguishing between the members of different groups.

In addition to statistical analysis, the researcher used content analysis to determine if themes arose from the qualitative data that supported and/or enhanced the statistical analysis. Answers to the follow up interview were systematically reviewed for common themes within each business strategy type. These themes as well as frequency of answers were recorded in a combined spreadsheet set up with the questions listed on the Y-axis and business strategy types listed across the X-axis. This spreadsheet was used for comparison of themes across business strategy types. The statistical analysis and content analysis combined to provide concise, descriptive findings.

Findings

Overall, findings indicate that significant relationships do exist between business strategy types and certain HRD activities. The research questions are combined into three sections and addressed below (also see Table 2).

Relationship Between Business Strategy Type and the Extent of Emphasis on Training

Types of training. Respondents were asked what percentage of overall departmental training was allocated to various types of training over the past year. Results indicated that percent of training time allocated to management/supervisory training, percent of training time allocated to team training, and percent of training time allocated to customer service training showed significant between-group variances at $p<.15$. An expert statistician and the researcher deemed this p-value appropriate to use as a cut off mark for inclusion in the discriminant function analysis because of the overall sample and subgroup sample sizes. All respondents from the defender, analyzer, and prospector strategy types reported that their training does support the overall business strategy.

Job categories of training recipients. Respondents were asked what percentage of overall departmental training time was allocated to various job categories over the past year. Results indicated that the percent of training allocated to line workers, middle managers, and professionals had significant between-group variances.

Training required by company. Few companies reported having a minimum amount of annual training required for all employees. Only four defenders (range = 16 to 50 hrs.), two analyzers (range = 1 to 40 hrs.), and three prospectors (range = 50 to 80 hrs.) reported having a minimum amount of annual training for all employees.

Relationship Between Business Strategy Type and the Extent of Emphasis on OD

Types of OD interventions. Respondents were asked what percentage of overall departmental time was allocated to various types of OD interventions over the past year. Results indicated that time allocated to strategic OD interventions showed significant between-group variances. When asked to describe a significant OD intervention implemented over the past year, defenders (62%) described human resource-related interventions, analyzers (58%) described strategic OD interventions, and prospectors (56%) described HR process interventions.

Level of OD interventions. Respondents were also asked to indicate the percentage of overall departmental OD interventions allocated to various organization levels. Results did not indicate a statistically significant between-group variance. However, defenders (47%) reported having more success and increases at the individual level, analyzers (40%) reported the same at the organizational level, and prospectors (55%) at the group or team level.

Overall Relationship Between Business Strategy and the HRD Function

HRD dollars per employee. Results indicated that HRD dollars per employee showed a significant between-group variance. Results also indicated that prospectors have significantly more HRD dollars per employee than

defenders and analyzers. Defenders (67%), analyzers (53%), and prospectors (67%) said the HRD budget has increased over the past five years.

Overall HRD. Respondents were asked to indicate the percentage of overall departmental resources that were devoted to three major components of HRD (i.e. Training, OD, and CD) over the past year. Results did not indicate a statistically significant between-group variance. However, when asked how these percentages have changed over the past five years, defenders (63%), analyzers (57%), and prospectors (50%) said that OD had increased. Defenders (44%) also said that CD had increased. Defenders, analyzers, and prospectors all reported that the business strategy of their company has a large impact on the HRD function.

Discriminant Function Analysis. The eight variables found to be significantly different across the business strategy types were HRD dollars per employee, time spent on management training, time spent on team training, time spent on customer service training, training allocated to line workers, training allocated to middle managers, training allocated to professionals, and time spent on strategic OD interventions. Of these variables, HRD dollars per employee, time spent on team training, and time spent on strategic OD interventions showed the strongest relationship to business strategy type (see Table 2).

Discriminant function analysis was used to determine if this collective set of variables could predict membership in the three different business strategy types. The overall predictive capability of these variables was 69 percent, showing that using these variables to predict business strategy type membership would presumably double the likelihood of correct placement. The strongest predictive capability was for placement of defenders (77%), slightly less with prospectors (69%) and analyzers (62%). Table 3 presents an overview of major findings.

Table 2
Variable Pooled Means, Pooled Standard Deviations, Means by Group, Standard Deviations by Group, and Between-Group P-values

	Pooled means (s.d.)	Defender means (s.d.)	Analyzer means (s.d.)	Prospector means (s.d.)	Between-group p-value
HRD Dollars per Employee	507.18 (890.9)	210.08^{B} (249.20)	364.00^{B} (358.20)	947.46^{A} (1480.10)	.042**
Management Training	29.679 (15.75)	30.692 (15.96)	36.231 (16.85)	22.115 (14.36)	.065*
Team Training	9.3077 (8.824)	9.5385^{AB} (7.253)	6.6923^{B} (8.138)	11.6923^{A} (10.711)	.054*
Customer Service Training	9.897 (10.80)	14.0385 (12.31)	8.3462 (11.69)	7.3077 (7.85)	.139
Line Workers Job Category	23.500 (20.66)	32.538^{A} (22.29)	9.769^{B} (12.87)	28.192^{AB} (24.87)	.066*
Middle Managers Job Category	16.000 (11.33)	11.192^{AB} (7.84)	24.615^{A} (16.67)	12.192^{B} (6.80)	.082*
Professionals Job Category	16.821 (18.82)	5.885 (5.18)	19.577 (21.88)	25.000 (23.61)	.107
Strategic OD Interventions	19.963 (19.67)	18.946^{AB} (24.00)	29.769^{A} (22.21)	11.173^{B} (9.57)	.028**
n		13	13	13	

*p <= .10, **p <= .05
note: superscripts represent significant differences between paired groups found in Scheffe post hoc multiple comparison at p <= .10.

Table 3
Major Findings by Business Strategy Type

Defenders	Analyzers	Prospectors
-fewest HRD dollars/employee	-moderate HRD dollars/employee	-most HRD dollars/employee
-emphasis on management/supervisory and job/specific technical training and customer service training	-emphasis on management/supervisory and job specific technical training	-emphasis on job specific technical training and team training
-emphasis on line workers	-emphasis on middle managers	-emphasis on professionals
-emphasis on HR type intervention	-emphasis on strategic type OD interventions	-emphasis on HR process type interventions
-increase in HR process type interventions	-increase in strategic and organization structure type interventions	-increase in HR process and technology type interventions
-emphasis at the individual level	-emphasis at the organizational level	-emphasis at the group or team level
-increase in OD and CD	-increase in OD	-increase in OD

Discussion

Extent of Emphasis on Training

With a focus on high growth, intense market penetration, increased production, and cost efficiency, defenders seem to place a greater emphasis on management/supervisory training, customer service training, and training for line workers. These findings are consistent with Schuler and Jackson's (1987) report that defender types have a high need for promotion from within and a high degree of concern for quantity of output, which would likely increase supervisory training and training for line workers who are closest to the customer and to the production of that output.

Unlike defenders, analyzers have a stronger focus on process adaptation, high quality products and services, and advanced engineering and manufacturing skills to make new products or services better. Results of this study indicate that analyzers emphasize management/supervisory training and training for middle managers. These results are also consistent with Schuler and Jackson's finding that analyzer types have high levels of employee participation, which would likely increase training for middle managers who must assume new skills in coaching and encouraging employee participation rather than a more traditional role of control and command. Middle managers must also oversee the processes implemented to create high quality products and services.

Prospectors have a broad, changing product line focused on product innovation and market responsiveness in order to be 'first in' to new markets. Findings show that prospectors place a greater emphasis on job specific technical training, team training, and training for professionals. Schuler and Jackson (1987) found that prospector types require a high level of cooperative, interdependent activity and rely on a high degree of creative behavior in order to continually create new innovations. Thus, it appears likely that prospectors have a larger percentage of professional positions that require technical skills and a great deal of communication between teams to remain competitive by have the most innovative products or services first in the market.

Extent of Emphasis on Organization Development

Findings indicate that defenders place a greater emphasis on human resource type OD interventions such as setting goals and performance appraisals as well as an emphasis on individual level OD interventions. These findings are related to findings by Youndt et al. who report that defender types focused more HRD administrative tasks such as policies and procedures rather than more comprehensive level HRD issues. The findings are also consistent with Schuler and Jackson's (1987) report that defender types focus more on individual activity and have a shorter term focus when compared to other business strategy types. Defenders also appear to have seen an increase

in HR process type interventions, which is related to Fiedler, Teng, and Grover's (1995) finding that defender types are using more business process and redesign (BPR) focused on interfunctional processes.

Analyzers seem to place a greater emphasis on strategic type interventions such as analyzing what products/services to provide and how to transform the environment, and an emphasis on organization level interventions. This finding appears to be related to Schuler and Jackson (1987) finding that analyzer types were found to have a longer term focus and higher commitment to the goals of the organization when compared to the other types of training. This may be due in part to the high degree of total quality management initiatives that seem to have impacted the implementation of the analyzer business strategy. Total quality management philosophy requires that all levels of employees actively participate, and that each job has an explicit connection to the goals of the organization.

In addition, it appears that prospectors place a greater emphasis on HR process type interventions and group or team level interventions. This finding seems directly related to findings by Schuler and Jackson (1987) that indicate prospector types require a high level of cooperative, interdependent activity associated with work that requires close interaction and coordination between people. Prospectors also appear to have seen an increase in HR process and technology type interventions, which is consistent in part with Chaya's (1995) finding that a strong relationship exists between high information technology spending and differentiation through innovation.

Overall Relationship Between Business Strategy and the HRD Function

The data indicate that out of the three business strategy types, defenders have the fewest HRD dollars per employee, analyzers have more HRD dollars per employee than defenders but less than prospectors, and prospectors have the most HRD dollars per employee. Several findings from previous research are consistent with these findings. For instance, Jackson et al. (1989) found that defender types have fewer hours of training than other business strategy types and Schuler and Jackson (1987) found that defender types have minimal levels of employee training and development. Jackson et al. (1989) found that prospector types have more total hours of training and a greater percentage of employees received training than in other business strategy types. Torraco and Swanson (1995) state that knowledge drives product innovation and employees are carriers of that knowledge. Perhaps prospectors have grasped this concept and applied it to achieve their business strategy focused on innovation.

It appears that a strong relationship exists between certain HRD practices and business strategy. The following eight HRD practices seem to have the strongest relationship to business strategy: 1) HRD dollars per employee, 2) percentage of training time allocated to management training, 3) percentage of training time allocated to team training, 4) percentage of training time allocated to customer service training, 5) percentage of training allocated to line workers, 6) percentage of training allocated to middle managers, 7) percentage of training allocated to professionals, and 8) percentage of time spent on strategic OD interventions.

Contrary to much of the literature that presents "best practices" in HRD, findings from this study indicate that the best or most effective HRD practices are not necessarily universal across all companies, but rather seem strongly dependent on the chosen business strategy of the firm.

Significance of the Study

This study provides information to businesses and HRD professionals alike on the current status of the relationship between organizational business strategy and the HRD function. By doing so, the study provides current information to organizations with similar business strategies on the linkages that exist between business strategy and the HRD function. The study also provides companies attempting to change their business strategy with information on how they might position their HRD function to achieve their goal.

The results show how some of the top U.S. companies are positioning their HRD resources to provide the knowledge and skills necessary to gain or maintain a sustainable competitive advantage in relation to their chosen business strategy. In addition, this study provides HRD practitioners with insight on types of programs, money spent on programs, and the level of programs that companies in different business strategy groups are using to develop their employees. The results of this study help organizations and the HRD function, specifically, understand how business strategy and the HRD function relate within the overall system. HRD professionals should be better able to understand, justify, and improve the nature of their function in relation to the competitive position of their organization through the relationships found in this study, thus making a necessary step towards developing human capital in a way that truly advances the competitiveness of the organization.

References

Beer, M., & Eisenstat, R. (1996). Building an organization "fit" to compete: Avoid human resource programs and focus on management. Presentation at the Corporate Effectiveness and Human Resource Practices Conference: Chicago, IL.

Bird, A., & Beechler, S. (1995). Links between business strategy and human resource management strategy in U.S.-based Japanese subsidiaries: An empirical investigation. Journal of International Business Studies, 26(1), 23-46.

Cocheu, T. (1992). Training with quality. Training and Development Journal, 46, 22-29.

Hamel, G., & Prahalad, C. K. (1994). Competing for the future. Boston: Harvard Business School Press.

Huselid, M. A., Jackson, S. E., & Schuler, R. S. (1997). Technical and strategic human resource management effectiveness as determinants of firm performance. Academy of Management Journal, 40(1), 171-188.

Jackson, S. E., Schuler, R. S., & Rivero, J. C. (1989). Organizational characteristics as predictors of personnel practices. Personnel Psychology, 42, 727-786.

McDaniel, S. W., & Kolari, J. W. (1987). Marketing strategy implications of the Miles and Snow strategic typology. Journal of Marketing, 51, 19-30.

McLagan, P.A. (1996). Great ideas revisited. Training and Development Journal, 50(1), 60-65.

Miles, R. E., & Snow, C. C. (1984). Designing strategic human resource systems. Organizational Dynamics, 13, 36-52.

Miles, R. E., & Snow, C. C. (1994). Fit, failure, and the hall of fame: How companies succeed or fail. New York: The Free Press.

Nadler, D. A., & Tushman, M. L. (1992). Designing organizations that have good fit: A framework for understanding new architectures. In D. A. Nadler, M. S. Gerstein, R. B. Shaw, and Associates (Eds.) Organizational Architecture: Designs for Changing Organizations (pp. 39-59). San Francisco: Jossey-Bass Publishing.

Sapsford, R., & Jupp, V. (1996). Data collection and data analysis. London: Sage Publications.

Schuler, R. S., & Jackson, S. E. (1987). Linking competitive strategies with human resource management practices. Academy of Management Executive, 1(3), 207-219.

Seibert, K., Hall, D., & Kram, K. (1995). Strengthening the weak link in strategic executive development: Integrating individual development and global business strategy. Human Resource Management, 34, 549-567.

Shortell, S. M., & Zajac, E. J. (1990). Perceptual and archival measures of Miles and Snow's strategic types: A comprehensive assessment of reliability and validity. Academy of Management Journal, 33(4), 817-832.

Thurow, L. (1997). Changing the nature of capitalism. In Gibson, R. (Ed.) Rethinking the future (pp. 228-249). London: Nicholas Brealey Publishing.

Torraco, R. J. & Swanson, R. A. (1997). The strategic roles of human resource development. Human Resource Planning, 18(4), 11-21.

Ulrich, D. (1998). A new mandate for human resources. Harvard Business Review, January-February, 124-134.

Weinberger, L. A. (1998). Commonly held theories of human resource development. Human Resource Development International, 1(1), 75-93.

Youndt, M. A., Snell, S. A., Dean, J. W., & Lepak, D. P. (1996). Human resource management, manufacturing strategy, and firm performance. Academy of Management Journal, 39(4), 836-866.